DOCUMENT RESUME

ED 460 705 JC 990 218

TITLE	High Tech Centers for Students with Disabilities in the California Community Colleges: A Program Outputs Study.
INSTITUTION	California Community Colleges, Sacramento. High-Tech Center for the Disabled.
PUB DATE	1999-02-22
NOTE	20p.
PUB TYPE	Reports - Research (143)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Access to Education; *Accessibility (for Disabled); *Assistive Devices (for Disabled); *Community Colleges; Compliance (Legal); *Computer Uses in Education; Disabilities; Educational Planning; Educational Technology; Institutional Mission; Learning Disabilities; Program Implementation; *Special Needs Students; Student Needs; *Two Year College Students; Two Year Colleges
IDENTIFIERS	*California Community Colleges

ABSTRACT

This document overviews a descriptive study conducted by the High-Tech Training Unit (HTCU) at the request of the California Community College Chancellor's Office. The mission of the 114 High Tech Centers (HTCs) at California Community Colleges is to train disabled students in the use of access technologies as a method of mainstreaming them into campus computing facilities and instructional resources. In addition to evaluating the success of the HTCs and their students, the purpose of the study was to gain information about the services provided by HTCs, including who they serve, what staffing and equipment resources are provided, and how HTCs interact with local campus and off-campus contingency groups. A survey instrument was developed and sent to 27 California community colleges requesting information about academic year 1997-1998. Results from the 27 institutions indicate that, overall, HTCs are providing diversified programs that have adapted themselves to the needs of students and institutional resources. The majority of programs offer training courses to blind, low vision, physically disabled, and learning disabled students. Results also suggest that measures of success are based primarily on whether students pass HTC courses, while few colleges focus on competency with specific tools, student outcomes, or program operations. Further results and limitations are discussed, and recommendations are offered. (SKF)

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ED 460 705

High Tech Centers for Students with Disabilities In the California Community Colleges

A Program Outputs Study

Prepared by
The High Tech Center Training Unit
Of the California Community College Chancellor's Office

In Consultation with
The High Tech Center Training Unit Advisory Committee, and
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February 22, 1999

JC 990218

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Executive Summary

The original mission of High Tech Center (HTC) programs was to train disabled students in the use of access technologies that would allow them to use campus mainstream computing facilities and instructional resources. This activity was precipitated in 1986 by the diverse and dramatic ways in which computer technology had begun to influence and change education in the California Community Colleges. The 114 High Tech Centers at California Community Colleges (and satellite centers) were established in a succession of growth and funding cycles beginning in October of 1986 and ending in 1996. Although staffing patterns and equipment configurations vary somewhat from location to location, the consistent mission of these programs remains training students in the use of assistive computer technologies that will allow them to compete with, and succeed academically, in classes at a rate similar to their non-disabled peers.

Over the past twelve years these HTC programs have grown and evolved. There have been major changes in the quantity, complexity and sophistication of assistive technologies used by these programs. Computer applications that didn't exist at the program's inception —Windows, Internet, World Wide Web, student e-mail, CD-ROM, DVD, web-based distance education, and a variety of other computer-related services— have now become an integral part of academic life.

In order to better understand the current state of HTC operations and services, at the request of the California Community College Chancellor's Office the High Tech Center Training Unit (HTCTU) undertook an exploratory study. We hoped to learn more about the services the HTCs provide, who they are serving, specifically what services they are providing, what staffing and equipment resources are available, and how HTCs interact with local campus and off-campus constituency groups. Finally we hoped to learn more about how HTCs evaluate the successes of their students and their own success as a program.

The findings show that HTCs are diversified programs that have adapted themselves to the needs of their students and the resources of their campuses. The High Tech Center programs in the California community colleges are providing the equipment and delivering the trainings they were intended to offer. They have fully transitioned from a grant-funded service to become an integral component of DSP&S, which is supported by categorical funds.

HTCs continue to provide a well utilized and much needed service for students. On average, programs have approximately forty staff hours available per week and provide labs that are open an average of twenty-five hours per week. HTCs report good utilization of computer resources. There is a fairly consistent distribution of access equipment availability state-wide, with the great majority of HTCs able to provide access tools for blind, low vision, physically disabled and learning disabled students. HTC staff participate on a broad range of campus planning and decision-making committees involved with technology, academic policy and governance.

Training is provided largely through courses, which are flexible and responsive to unique student requirements. HTCs are largely driven by student needs and do not appear to make data driven decisions regarding services, course content, and course modification. Local measures of student success are based largely on students' passing HTC courses. Only a few colleges include broader criteria such as competency with the specific access tools the student intends to use, ability to use access tools to complete course work in mainstream classes, ability (where possible) to use access tools in mainstream computer labs. Programs collect little data about student outcomes or program operations, though some relevant data is collected by campus MIS. In light of the Partnership for Excellence guidelines and increased popularity of performance based funding, HTCs might consider creating a data driven decision making model and accountability measures.

A major dilemma facing HTCs is the lack of access technology available in mainstream college computing facilities. Twelve years after the start of the HTCs, less than half of California community colleges have equipped their mainstream computer labs with even basic access technologies. In the absence of access to mainstream campus computing resources, students with disabilities may well be bottlenecked at HTCs around the state. At present rates of staff and resource utilization, the HTCs are presently able to serve 20% of DSP&S students. Increases in this "resident" group may likely erode the ability of HTCs to meet the needs of new students.

High Tech Centers operating today in California community colleges function in a technological environment dramatically more complex than when these programs were begun. The original vision of HTCs included access to

word processing and basic skills software. Today's HTC regularly addresses student access to advanced office suites, programming environments, internet, world wide web, e-mail, computer assisted design, library access systems, computer assisted instruction and more. In order to work with computer applications orders of magnitude more complex than those available ten years ago, access tools have increased dramatically in complexity and sophistication. The level of technological expertise required of HTC staff has risen steadily to match the skill levels needed to teach students the use of new computer access tools.

The original HTC mission of preparing disabled students to use access technology has grown and evolved. HTC staff now deal with complex issues of training, advocacy, campus technology, and community outreach. This growing responsibility does not rest on HTC staff alone, but will require collaborative partnerships with a broad range of campus units, community agencies, social services and public schools.

Recommendations

1. Effective availability, training, and usage of access technology for disabled students will require collaborative partnerships between HTC and a wide range of campus units including campus computing services, libraries, campus administration, and various campus committees. Failure to do so may well impose a significant hardship on student with disabilities.
2. In order to maximize the use of public education funds, more clearly defined and formalized relationships should be established between HTCs and the K-12 education system, the California university systems and the Department of Rehabilitation, both statewide and locally. This would facilitate easier transitions in service for students as they move between systems.
3. Given the increasing demands for accountability, such as the Partners in Excellence, and the increasing focus on student outcomes, the HTCs, and other DSP&S programs have the opportunity to define their student outcomes comprehensively and then consider how to collect that data, and how to use that student data to make program and campus decisions.
4. Once effective measures of HTC student and programmatic success have been established, a second study to examine DSP&S student outcomes should be undertaken. Since access to an HTC program represents only one factor in an array of DSP&S services that contribute to student outcomes, such a study would need to be much broader in scope, adequately funded and conducted over an extended period of time.
5. In the changing technological context, the roles and responsibilities of HTC staff have changed. The HTCs surveyed acknowledged this and have tried to respond to increasing requests for campus information and outreach opportunities. To support this more complex role, HTC staff will need training and support in the use of more sophisticated technology and in the emerging roles of community outreach, advocacy, and campus negotiations.

Introduction: High Tech Centers

The original mission of High Tech Center programs was to give disabled students training in the use of access technologies that would allow them to use campus mainstream computing facilities and instructional resources and to compete with and succeed academically in classes at a similar rate as their non-disabled peers. This activity was precipitated in 1986 by the diverse and dramatic ways in which computer technology had begun to influence and change education in the California community colleges.

The High Tech Centers (HTCs) in California community colleges have been operating for more than twelve years. HTCs were established in a succession of growth and funding cycles. The first cycle occurred between October, 1986 and June, 1988 when the California Department of Rehabilitation provided $5.5 million for establishment of 51 centers. These HTCs were largely identical in staffing, services and content. Between 1989 and 1992, the growth of HTCs continued as community colleges across the state independently funded start-up programs. Programs created during this period varied widely in terms of staffing and services. Between 1992 and 1996, state funding again became available to begin new community college HTC programs and augment hardware/software in existing programs. Although some degree of continuity in hardware/software configuration and staffing was strongly encouraged in these new sites, there were not the prescriptive guidelines used by the 1986-1988 start-up HTCs. Although the HTCS across campuses share a common mission and name, programs developed after 1988 have wide variability in all areas of program operation, services and staffing.

There are now 114 HTC programs in California community colleges and satellite centers. Over the past ten years the High Tech Centers have grown and changed dramatically, evolving to meet the needs (and budgetary constraints) of their local campuses. Moreover, there have been major changes in the quantity, complexity and sophistication of assistive technologies used by these programs. Computer applications which didn't exist at the program's inception—Windows, Internet, World Wide Web, student e-mail, CD-ROM, DVD, web based distance education, and a variety of other computer-related services—have now become an integral part of academic life.

Background to the study

In order to better understand the current state of HTC operations and services, at the request of the California Community College Chancellor's Office, the HTCTU undertook an exploratory study. We hoped to learn more about the services the HTCs provide, who they are serving, specifically what services they are providing, what staffing and equipment resources are available, and how HTCs interact with local campus and off-campus constituency groups. These questions about on- and off-campus outreach were included at the suggestion of the Advisory Committee because they noted the expanding roles and responsibilities of HTC staff. Finally we hoped to learn more about how HTCs evaluate the successes of their students and their own success as a program.

This response was timely, the California Community College Chancellor's Office had received communication from the Office of Civil Rights (OCR), Department of Education containing the following opinion regarding provision of effective communication:

> *[T]he issue is not whether the student with the disability is merely provided access, but the issue is rather the extent to which the communication is actually as effective as that provided to others. Title II [of the Americans with Disabilities Act of 1990] also strongly affirms the important role that computer technology is expected to play as an auxiliary aid by which communication is made effective for persons with disabilities.*

In particular, OCR was concerned with California community college campuses' provision of adaptive tools and services to blind and low vision students.

Given the range and diversity of services provided by DSP&S to students with disabilities in community colleges, and the difficulty of attributing student outcomes to any single service, this study focuses on HTC outputs. We thought that it was necessary to first describe the range—both similarities and differences— among HTCs before attempting to describe student outcomes.

The study was planned with the participation of the HTCTU Advisory Committee as well as an external consultant. The consultant, an educational evaluator from the University of Texas at Austin, worked closely with the HTCTU Director and Advisory Committee to develop the survey instrument. The survey was developed in Spring 1998 and field-tested at three sites over the Summer. A copy of the survey can be found in Appendix A. In October 1998, the survey was sent to a sample of twenty-seven community colleges and requested information about academic year 1997-1998.

The criteria-based sample was constructed in consultation with the HTCTU Advisory Committee and representatives of California Community Colleges Chancellor's Office. The twenty-seven colleges were chosen to represent a range of small, medium, and large institutions located in rural, suburban, and urban area, in Northern, Central and Southern California. All twenty-seven colleges completed and returned the survey. A list of the colleges included in this stratified sample can be found in Appendix B.

Limitations of the study

As noted above, the study focuses on describing the services and outputs of a sample of HTCs.

In order to gain a range of program perspectives, the sample design was purposive and categorical. Sites were stratified by size, location, and geographical area, and may not reflect the actual distribution of campuses or student population in community colleges. In spite of the sample design, in the quantitative analysis, no significant differences were found by campus size or location, so data are reported as an aggregate of the total sample.

Although all twenty-seven colleges included in the sample responded, many respondents did not fully complete the survey. As with any such study, the consequences of missing data should be taken into account when reviewing the findings of the study. Additionally, the survey instrument requested data (unduplicated head count, gender, ethnicity) not ordinarily kept by HTC programs. For some participants, the difficulty of collecting such information may have introduced errors in the data. For example, there were some inconsistencies between the total number of staff reported in one question, and the total when all positions were added up from later questions.

We note also that the survey was limited to examining the HTCs. Although the survey asked about assistive technologies available in campus labs, there was no attempt to elicit information directly from the campus perspective, from campus administration, from computing services, or from the DSP&S office. Thus there are no direct data on the responsiveness or commitment of the institutions.

The researchers themselves are both an asset and a liability in any study, and the capacity for the researcher to interpret the data is always a potential limitation. In this case, both quantitative and qualitative data were gathered, and analytical methods of both approaches were used. In the case of quantitative data, some of the responses were aggregated in ways that made interpretation difficult and in a few cases (for example, when programs responded with a semester average rather than a monthly average) the researchers interpreted these self-reported data. In analysis of the quantitative data, only distributive statistics were run. In addition, the qualitative data was listed and categorized by the researcher in an attempt to identify patterns in the responses. The qualitative researcher is not an expert on community colleges so she consulted with both the HTCTU Director and other community college experts, but nonetheless, we acknowledge that the qualitative data was subject to interpretation.

Analysis

The twenty-seven (27) colleges participating in the survey were from rural (30%) urban (30%) and suburban (40%) locations. Twenty-six percent (26%) of the colleges were small (1500-7500 students). Forty-one percent (41%) were medium sized (7500-15000 students). Thirty-three percent (37%) were large (15,000-20,000+ students).

Campus Size		
	Number of Respondents	*Percent of Total*
1500 - 3000 Students	2	7%
3000 - 7500 Students	5	19%
7500 - 10,000 students	4	15%
10,000 - 15,000 students	7	26%
15,000 - 20,000	2	7%
20,0000+ students	7	26%
Total		100%

Location of Campus		
	Number of Respondents	*Percent of Total*
Rural	8	30%
Urban	8	30%
Suburban	11	40%
Total		100%

Of the twenty-seven (27) colleges that responded to the question *"How long has your High Tech Center been in operation?"* the great majority (70%) reported that they had been in operation five years or more.

How long has your HTC been in operation?		
	Number of Respondents	*Percent of Total*
Two Years or Less	2	8%
Three Years	3	11%
Four Years	3	11%
Five Years or More	19	70%
Total		100%

Of the twenty-seven (27) campuses surveyed, eight (8) were part of the original programs started between 1986 and 1988.

To the question *"How many students were served by DSP&S in the 1997-98 academic year?"* twenty-five (25) colleges responded. On average, they served 773 students. The largest served 2,000 students and the smallest 117.

Students demographics

A portion of the survey focused on learning more about how many students the HTCs are serving and who they are. In this section we explored questions not only of disability, but also of gender and ethnicity. Twenty-one (21) colleges responded to the question *"How many students (unduplicated head count)— in classes and in labs— did your HTC serve in the 1997-1998 academic year?"* Of these, the smallest reported total number of students served in classes was 14, and the largest was 325, with an average of 100. Of the twenty-two (22) colleges that responded that they held labs for students, the smallest reported total number of students in labs was 33, the largest reported serving 325 students, with an average of 109.

Information regarding the total number of students and the range of disabilities served by HTCs in this survey is summarized in the table below. Twenty-three (23) colleges responded to this question.

During the 1997-98 academic year, how many students with one of the following primary disabilities were served by your HTC?			
	Number of Respondents	*Number of Students*	*Percent of Total*
Mobility	23	371	11%
Vision	23	228	7%
Deaf/Hard-of-Hearing	23	110	3%
Speech/Language	23	28	1%
Learning Disabled	23	1216	35%
Acquired Brain Injury	23	352	10%
DDL	22	266	8%
Psychological Disability	23	241	7%
Other	23	272	8%
No Disability	23	336	10%
Total			100%

It is worth noting that only 19 campuses responded to the question of gender distribution and only 16 responded to the question about distribution of ethnicity for students with disabilities participating in their HTC programs. Therefore, this data may not accurately represent a description of who is being served in a broader range of HTC programs.

During the 1997-98 academic year, how many students served by the HTC were male/female.			
	Number of Respondents	*Number of Students*	*Percent of Total*
Male	19	1092	47%
Female	19	1245	53%
Total			100%

During the 1997-98 academic year, how many students served by the HTC were:			
	Number of Respondents	*Number of Students*	*Percent of Total*
Black	16	267	12%
Hispanic	16	377	13%
Asian/Pacific Islander	16	126	6%
American Indian	16	53	2%

Caucasian	16	1347	61%
Other	16	132	6%
Total			100%

Classes and Services

This portion of the survey was designed to examine what services and classes the HTCs offer. In response to the question, "*What classes or trainings does your HTC offer?*" Six (6) campuses responded that they hold labs and work with students individually in that setting, but do not offer formal classes. The great majority of respondents that offer courses indicated that their courses were for credit, were listed in their college catalogue and had gone through a formal curriculum review process. The information is summarized in the following tables.

Are HTC classes listed in the college catalogue?			
	Yes	No	**Total**
Number of Respondents	21	6	27
Percent of Total	78%	22%	100%

Are HTC classes credit courses?			
	Yes	No	**Total**
Number of Respondents	20	5	26
Percent of Total	80%	20%	100%

Have HTC classes gone through a formal curriculum review?			
	Yes	No	**Total**
Number of Respondents	21	4	25
Percent of Total	84%	16%	100%

Class sizes varied. Of the nineteen (19) participants that responded to the question "*What is your average class size?*" there was a range from the smallest class size of 1 to the largest of 25, with an average class size of 13.

Of the twenty-six (26) colleges that responded to the question, "*Are classes or trainings curriculum/ skill-based, individualized, or both?*" the majority (87%) indicated that they were both. Of the twenty-two (22) colleges that responded to the question, "*Are classes grouped by access tools, computer application, or both*?" the majority (73%) indicated both. Findings are summarized in the following tables.

Are classes or trainings curriculum/skill-based, individualized or both?		
	Number of Respondents	*Percent of Total*
Curriculum/skill-based	1	4%
Individualized	2	9%
Both	23	87%
Total	26	100%

Are classes grouped by access tools, computer applications or both?		
	Number of Respondents	*Percent of Total*
Access Tools	1	4%
Computer Applications	5	23%
Both	16	73%
Total	22	100%

Responses the question, "*What factors determine the courses and content offered in your HTC?*" were complex. More than half responded that the major factor influencing their decision was "student need" and in particular, "needs of current students." A smaller number of programs also noted that their decisions were influenced by a broader context, for example, technological advances, discussions with Department of Rehabilitation staff, matriculation requirements, or their campus mission. A few campuses also noted that their decisions about offerings were shaped by limitations on equipment and staffing.

Twenty-five (25) colleges responded to the question, "*Do you offer open computer labs?*" The great majority of these (92%) said "yes". As a follow-up to that question we asked, "*How many hours per week is the lab open?*" Twenty-two (22) colleges responded. The shortest number of hours reported was 1 hour, the longest was 62 hours, with an average of 25 hours per week.

Staffing

Staffing represents one of the greatest variables in the HTC equation. Although staffing patterns were fairly consistent in the first five years of HTC development, they have varied dramatically in the ensuing years. Questions were asked in an attempt to identify current staffing patterns in HTCs statewide. Staffing patterns vary in level of professional staffing and total available staff hours. Information concerning staffing is somewhat complex and is delineated in the tables below. In general, of the twenty-four (24) colleges that responded to the question, "*How many total staff hours are available in the HTC each month?*" the smallest number of hours reported was16 and the greatest was 679, with a monthly average of 169 staff hours, approximately forty-two hours per week.

Of the twenty-five (25) colleges that responded to the question, "*How many HTC staff does your college have?*" the smallest number reported was 0, and the largest was 8, with a staff average of four. It is important to bear in mind that these composite staffing numbers do not differentiate between full and part-time staff, or between levels of professional staffing. For detailed information, please see the tables below.

HTC staffing distribution		
	Number of Staff	*Percent of Total*
Full and PT Certificated	40	38%
Full and PT Classified	18	17%
Full and PT Instructional Asst.	18	17%
Full and PT Lab Assistant	28	26%
Full and PT Administrator	2	2%
Total		100%

Number of full-time, certificated staff at your HTC?		
	Number of Respondents	*Percent of Total*
No Full-Time	15	56%
One Full-Time	7	25%
Two Full-Time	4	15%
Four Full-Time	1	4%
Total	27	100%

Number of part-time, certificated staff at your HTC?		
	Number of Respondents	*Percent of Total*
No Part-Time	11	41%
One Part-Time	13	48%
Two Part-Time	1	4%
Three Part-Time	2	7%
Total	27	100%

Number of full-time, classified staff at your HTC?		
	Number of Respondents	*Percent of Total*
No Full-Time	17	63%
One Full-Time	10	37%
Total	27	100%

Number of part-time, classified staff at your HTC?		
	Number of Respondents	*Percent of Total*
No Part-Time	22	81%
One Part-Time	4	15%
Four Part-Time	1	8%
Total	27	100%

Number of full-time, Instructional Associates at your HTC?		
	Number of Respondents	*Percent of Total*
No Full-Time	24	89%
One Full-Time	2	7%
Two Full-Time	1	4%
Total	27	100%

Number of part-time Instructional Associates at your HTC?		
	Number of Respondents	*Percent of Total*
No Part-Time	17	63%
One Part-Time	7	36%
Two Part-Time	2	7%
Three Part-Time	1	4%
Total	27	100%

Number of full-time lab aides/tutors at your HTC?		
	Number of Respondents	*Percent of Total*
No Full-Time	26	96%
One Full-Time	1	4%
Total	27	100%

Number of part-time lab aides/tutors at your HTC?		
	Number of Respondents	*Percent of Total*
No Part-Time	15	56%
One Part-Time	6	22%
Two Part-Time	3	11%
Four Part-Time	1	4%
Five Part-Time	1	4%
Six Part-Time	1	4%
Total	27	100%

Number of full-time Administrative Staff at your HTC?		
	Number of Respondents	*Percent of Total*
No Full-Time	25	93%
One Full-Time	2	7%
Total	27	100%

Number of part-time Administrative Staff at your HTC?		
	Number of Respondents	*Percent of Total*
No Part-Time	27	100%
Total	27	100%

Equipment

Staffing, equipment and students constitute the basic building blocks of the HTC programs. Questions about equipment sought to determine the number of computers available in HTCs, connection to the campus network, and frequency of computer purchases. All twenty-seven (27) colleges responded to equipment-related questions. In response to the questions, *"How many computers are in your HTC?"* the smallest number reported was 2, the largest was 43, with an average of 14 computers per HTC site. In response to the question, *"Is your HTC linked to the campus network?"* the majority of colleges (70%) reported that they were. In response to the question, *"When did you last purchase new computers for your HTC?"* ninety-two percent (92%) reported that they had purchased computers either this year or last year.

This survey sought to determine how funding was provided for the acquisition of assistive technology located in mainstream labs on campus. Twenty-seven (27) colleges responded to the question, *"Does DSP&S buy access technology for mainstream labs on campus?"* Thirty-seven percent (37%) responded that DSP&S did buy access technology for mainstream labs. The respondents were asked, *"Is there general fund money set aside for the purchase of access technology in mainstream labs on campus?"* Twenty-three (23) colleges responded, thirty-nine percent (39%) reported that funding was available.

This survey sought to determine the range of access technologies available to students in HTC programs around the state. Twenty-seven (27) colleges responded to the question, "W*hich of the following access technologies are available to students at your HTC*?" All of the HTCs offered access technologies for blind, low vision, students with physical disabilities and learning disabilities. Sixty percent of surveyed centers provided access to Braille printers and basic skills software for acquired brain injuries. See table below for expanded detail.

Which of the following access technologies are available to students at your HTC?			
	Yes	No	Total Respondents
Screen readers for blind	27 (100%)	0 (0%)	27
Large print for low vision	27 (100%)	0 (0%)	27
Speech recognition	26 (96%)	1 (4%)	27
Keyboard control	21 (78%)	6 (22%)	27
Scanner technology	26 (96%)	1 (4%)	27
Braille printer	16 (59%)	11 (41%)	27
Writing tools for LD	25 (93%)	1 (7%)	26
Basic skills for ABI	15 (56%)	11 (44%)	26

Articulation with other campus units and the broader community

This portion of the survey sought to describe the relationships between the HTC and various other programs and services in and around the campus community—DSP&S, Department of Rehabilitation, campus Management Information Systems, and other computing facilitates— as well as HTC outreach to the broader community. Because several of the questions in this section were answered in narrative, and respondents often included more than one item in an answer, numbers and percentages of responses reported are not a precise quantitative analysis, but rather reflect broad patterns and a general sensibility of respondents.

In response to the question, *"How does HTC integrate with DSP&S?"* the overwhelming response was that HTCs saw themselves as an integral part of the campus DSP&S program. In contrast, responses to the question, *"How does the HTC articulate with the Department of Rehabilitation?"* were more variable. The most common responses indicated that the majority of interactions were around specific students, and on an as-needed basis. Part of this interaction around individual students included providing technical support to DR counselors about assistive technology.

In response to the question, *"How does the HTC articulate with other computing facilities on campus (proactive, reactive, not happening)?"* more than two-thirds responded that the articulation was positive, proactive, and cooperative. Only two campuses reported that articulation with campus computing was not happening at all. A handful of campuses noted that the main interactions were reactive, and around specific issue or concerns as they arose.

On a more quantitative note, all twenty-seven (27) colleges responded to the question, *"What assistive technologies are located in campus computer labs outside the HTC?"* Slightly less than half reported that some assistive technologies were available outside the HTC for students who are blind, low vision, learning disabled or had physical disabilities. No resources for production of Braille printing were available on campuses outside HTCs. At 85% of the surveyed colleges, writing tools for students with learning disabilities were not available outside the HTC.

What assistive technologies are located in campus computer labs outside the HTC?			
	Yes	No	Total Respondents
Screen readers for blind	14 (52%)	11 (48%)	25
Large print for low vision	19 (70%)	6 (30%)	25
Speech recognition	7 (26%)	20 (74%)	27
Keyboard control	10 (37%)	17 (63%)	27
Scanner technology	15 (58%)	11 (42%)	26
Braille printer	0 (0%)	27 (100%)	27
Writing tools for LD	4 (15%)	23 (85%)	27

While campuses generally reported good working relationships with their colleagues in computer services, there were fewer specific examples of training for mainstream computer support staff in the use of assistive technology. Eight (8) of the campuses reported that they work actively with computer staff, and one (1) reported that they work actively with library staff. Seven (7) campuses responded that they work with computer staff on an "as needed" or "by request" basis. Four (4) HTC staff replied that they are available, but rarely used. On six (6) campuses, respondents said that such interactions were not happening.

In response to the question, *"Are HTC staff on campus committees?"* the majority (85%) of the twenty-six (26) respondents indicated that they were on campus committees. To elaborate on this response the survey instrument asked, *"Which ones?"* More than two-thirds of the campuses reported that they are on some technology-related committee. Approximately one-quarter of the campuses have HTC staff serving on governance committees. Approximately one-quarter serve on various academic committees. Close to one-third serve on student service committees.

In response to the question, *"Are HTC staff involved in writing campus proposals, especially ones including technology?"* The majority (69%) of the twenty-six (26) colleges that responded reported that staff were involved in such activities.

Answers to the question, *"What kinds of outreach/ interaction do HTC staff engage in with campus faculty about access technology?"* varied. Close to two-thirds of the HTCs do formal, organized outreach, for example, inservice trainings, flex-day presentations, presentations at departmental meetings, presentations for groups of departmental chairs, and open house programs. Close to one-third reported that they have informal and/or "as requested" interactions. Three (3) campuses reported that there is little or no outreach activity to faculty.

HTC outreach goes beyond the campus. In response to the question, *"Does the HTC specialist engage in activities—including outreach and responses to request for information— from community agencies, including public schools?"* Of the twenty-six (26) colleges that responded, 77% reported that they do carry out such outreach activities. More

than half give presentations to and respond to inquiries from school communities, including students, parents and teachers and administrators. One-third of the HTCs reported that they have done some outreach to local disability service organizations or other community organizations. Approximately one-third of the HTCs are not currently doing any community outreach activities.

Student Outcomes

This survey sought to learn more about how HTC programs assess their own successes and the successes of students enrolled in HTC programs. Towards this end, a number of questions were formulated that addressed local measures of student and programmatic success.

The first question in this section was, *"How would you describe what students gain from their HTC experience?"* Twenty-five (25) HTCs responded. The most common response, close to two-thirds of the programs, noted that the students gained increased computer skills and literacy. The second most common response offered by close to half of the programs was increased confidence and skills in using computers in mainstream classes. A similar number of programs noted that students overall gained self-esteem, independence and confidence from their successes with the computer. Approximately one-fifth of programs said that students increased basic skills, and close to one-fifth said students gained better study strategies.

The answers to the question, *"What are your criteria for student success and how do you measure them?"* were complex. Twenty-four (24) HTCs responded. More than half of the programs defined success as meeting the goals and objectives and passing the HTC course. One quarter of the programs felt that competency in adaptive access was the measure of student success. One-third of the programs also considered student success in a number of broader contexts, including use of assistive technology in a multitude of campus settings, passing mainstream courses, increasing educational and career options, and continuing in the college curriculum.

Respondents were asked to address the question, *"What data does your HTC collect about services delivered to students with disabilities?"* Of the twenty-seven (27) responses, one-third of the programs left the question blank or reported that they collect no data. One-third keep sign-in sheets, time logs and attendance records. Approximately one quarter of the programs report that they keep the required demographic and disability data. In addition, 73% of twenty-six (26) responding programs reported that they gathered feedback from participants in their classes or trainings.

Respondents were asked, "*What data does your campus MIS system record about student with disabilities?"* Of the twenty-seven (27) respondents, three (3) did not reply and one (1) noted that the campus was changing systems and no data was presently available. Of the remaining twenty-three (23) campuses, all were aware that MIS tracks the data elements required by the Chancellor's office. Approximately one-third of the schools were also aware that their campus collects other non-required elements such as service(s) provided and contact hours. As a follow-up question, the survey asked, "*Does your college track the course-taking patterns of HTC students over the past three to five years?"* All of the twenty-three (23) respondents answered "no."

In addition, programs were asked if their campus DSP&S program had conducted any outcome studies. Twenty-six (26) programs responded, of which eighty-five percent (85%) indicated that no outcomes studies had been conducted. Fifteen percent (15%) of the programs reported that studies had been conducted. One HTC noted that their campus research has always included disabled students and they track course completion, persistence, grades, etc. Another HTC noted that their campus had found that the same percentage of students with disabilities as without received AA degrees.

Discussion

Resources and services

This study examines the services and outputs of HTCs in the California Community College system. In considering the overall operation of sampled High Tech Center programs, the reviewers were struck by both the differences and similarities among programs. Given the local configurations and missions of different campuses, variability among programs was expected and was most often noted in staffing. Yet there is considerable similarity among equipment and services. There appears, for example, to be a fairly even distribution of all types of assistive computer technologies statewide. Students are just as likely to find speech recognition technology available in a small, rural High Tech Center as in a large, urban High Tech Center. In fact, there appeared to be little or no correlation between resource availability and size, years in operation, location, or staffing. Exceptions to this generalized, widespread availability of assistive technologies were noted for availability of Braille printers (60%) and cognitive retraining software for students with acquired brain injuries. Although some California community colleges do not offer cognitive retraining programs for students with acquired brain injuries, nothing in the data provides any explanation for the relative absence of Braille printing resources at some campuses.

The majority of HTCs offer credit classes, which are listed in the course catalogue and have gone through by the campus curriculum committee. Review by such committees speaks to the academic rigor of HTC courses, however the data provided no information about transferability of course credit to four year institutions. Although an average class size of thirteen (13) is small, it is not unusually small for classes offered through California community college DSP&S programs. A sizeable minority of sites—six (6) of the twenty-seven (27) in the sample—offer no formal classes and provide training on an individualized basis through open labs.

HTC programs are highly oriented to student needs. Individualization and customization of student training was a recurring theme. Even those sites that offered HTC courses indicated that these courses were generally modified to meet unique student needs. Although nothing in the data suggested what such individualization might consist of, in many Special Education settings, this could include presenting information in smaller informational segments, proceeding at a slower instructional pace and offering information in a number of formats to accommodate the diverse learning styles of students. The HTCs in this survey appear to have maintained an open and flexible instructional approach geared to the unique needs of the student population that they serve.

With the available staffing and equipment resources, California Community College High Tech Center sites presently are able to accommodate approximately 20 percent (20%) of the total DSP&S student population served by colleges in the sample. With only sixteen (16) colleges responding to the questions of student demographics, the ethnicity data collected was incomplete, and may also reflect incomplete data collection. However, there appears to be a disproportionately higher percentage of Caucasian students receiving services through the HTCs than the overall community college population and the total DSP&S population. The data provide no explanations for these disproportionate numbers. The researchers speculate that this could be examined further, and might reflect cultural attitudes regarding disability and a resulting reluctance by students to participate, or possibly a missed opportunity on the part of HTC staff to provide effective outreach to minority communities or some other unidentified factor(s).

The researchers found that on average HTC sites report a substantial number of staff hours (169) available each month, amounting to over forty hours weekly. Although the data did not provide a precise breakdown of certificated versus non-certificated staff hours, it did reveal a full-time certificated to part-time certificated staffing ratio of 19:21 (approximately 1:1) and an aggregate full-time to part-time staffing ratio of 36:70 (approximately 1:2). Whether or not these available staff hours and staffing ratios are consistent with other programs of similar size within the DSP&S framework is beyond the scope of this study.

The majority of HTCs are able to purchase and update equipment on a regular basis and are connected to the campus network. The availability of computer systems current with campus technology and linkages to the campus network should facilitate transition to mainstream campus computing resources by students with disabilities on campuses where mainstream computing facilities have been equipped with access technologies.

Articulation with the broader community

The original mission of HTCs was to prepare students with disabilities to use access technology in mainstream campus computer labs and classrooms. But during the last twelve years, the technological environment has become increasingly complex. In order to serve students effectively, the mission of HTCs has expanded, and entails not only working directly with students, but working collaboratively with other campus units.

In light of this emerging mission a notable number of HTC sites are well represented on a variety of campus committees addressing technology, planning, governance and academic issues. It would appear that many HTC staff are participating in the shared governance process to raise technology access issues of immediate concern as well as questions dealing with long-term campus technology access. However, more than half of the responding campuses do not have the full time certificated staff most likely to have the time and professional expertise to work effectively on campus committees. Additionally, the presence of an HTC staff member on a committee is not necessarily equivalent to bringing about a desired result; issues of institutional commitments and technological priorities would also need to be considered. This was beyond the scope of this study.

Beyond direct service to students, HTCs respond as they can to requests for information from campus units and community agencies, including schools and social services. HTCs have recognized the importance of filling this informational role within their campus and community. Such a context may be essential for facilitating general distribution of access technologies on campus and transition of HTC students to mainstream campus computing facilities. But HTCs are somewhat constrained by resources in their ability to meet all potential needs for information. Some collaborative work and outreach activities are taking place with Department of Rehabilitation, faculty, staff and community. However, more formalized and regular communication, particularly with Department of Rehabilitation, could better serve students.

Outcomes and accountability

Much as the technological environment has become more complex, the political environment for accountability is also becoming increasingly complex. Programs such as the Partnership for Excellence will be mandating more data and accountability related to student outcomes.

The current measure of student success most often used by HTC programs is completion of a HTC course. Given the original mission of HTCs and the emerging mission, this single measure may not be adequate. Efforts to evaluate the success of HTC students might also include measures of competency with the specific access tools the student intends to use, ability to use access tools to complete course work in mainstream classes, ability (where possible) to use access tools in mainstream computer labs. In the long-term, colleges might wish to consider tracking the course taking patterns and course completion rates of students who have successfully completed HTC courses. None of the twenty-seven (27) colleges surveyed presently track this information.

In addition, there is little evidence that colleges are making data driven decisions concerning HTC courses and services. Both qualitative and quantitative information collected by this survey suggest that colleges do not presently engage in long-term planning of HTC course content, modify course content based on student outcomes, or plan future courses based on emerging technologies or community/business needs. Although HTC programs are aware that their campus MIS programs collect important student data, we saw no indication that such data is used by HTCs to plan or modify course content. Additionally, HTC programs appear to gather very little data about the operation of their own programs. Only three DSP&S programs responding to the survey had ever done student outcomes studies. Course content and HTC services appear to be driven by immediate student need. It should also be noted that no data were available in the survey instrument as to how, or if, student data are collected, analyzed and employed within the larger framework of DSP&S programs in the aggregate. In the absence of such information, the researchers have no basis for determining whether or not DSP&S programs in general make data driven decisions.

Conclusions

HTCs today are faced with a dilemma. Their original purpose was to educate students in the use of assistive computer technologies so that these students could compete successfully in mainstream programs on campus. Twelve years after the inception of High Tech Center programs on community college campuses, less than half of all colleges surveyed have the most basic access tools in their mainstream computer labs. Eighty-five percent (85%) of mainstream campus computing labs do not have access tools for students with learning disabilities; the largest single population served by HTCs.

In the absence of access technology in mainstream campus computing resources, students with disabilities may be bottlenecked at HTCs around the state. The size of many HTCs may be in part a response to the lack of available assistive computer technology resources elsewhere on campus. The collected data indicate that HTCs are presently able to serve about twenty percent (20%) of students in DSP&S programs. What percent of overall service need this twenty percent (20%) represents is not clear. It is reasonable to assume, however, that without significant increases in the availability of access technologies and support staff in mainstream computing facilities, the numbers of students with disabilities restricted to using the access tools available through the HTCs will increase. At present rates of staff and resource utilization, as this "resident" group increases, HTCs will likely see erosion of their ability to meet the needs of new students.

Moreover, High Tech Centers operating today in California community colleges function in technological environment dramatically more complex than when these programs were begun. The day-to-day tools of these programs, complex networking, advanced office suites, internet, world wide web, e-mail and web based distance learning, simply did not exist when these programs were begun. High Tech Center faculty and staff who were once expected to learn perhaps four or five access tools, must now learn a dozen or more. In order to work with computer applications orders of magnitude more complex than those available twelve years ago, access tools have increased dramatically in complexity and sophistication. The level of technological expertise required of HTC staff has risen to match advances in new computer access tools. The original vision of HTCs included access to word processing and basic skills software. Today's HTC regularly addresses student access to advanced office suites, programming environments, internet, world wide web, e-mail, computer assisted design, library access systems, computer assisted instruction and more.

The original HTC mission of preparing disabled students to use access technology has grown and evolved. HTC staff now deal with complex issues of training, advocacy, campus technology, and community outreach. This growing responsibility does not rest on HTC staff alone, but will require collaborative partnerships with a broad range of campus units, community agencies, social services and public schools.

Recommendations

1. Effective availability, training, and usage of access technology for students with disabilities will require collaborative partnerships between HTC and a wide range of campus units including campus computing services, libraries, campus administration, and various campus committees. Failure to do so may well impose a significant hardship on student with disabilities.
2. In order to maximize the use of public education funds, more clearly defined and formalized relationships must be established between HTCs and the K-12 education system, the California university systems and the Department of Rehabilitation, both statewide and locally. This would facilitate easier transitions in service for students as they move between systems.
3. Given the increasing demands for accountability, such as the Partnership for Excellence, and the increasing focus on student outcomes, the HTCs, and other DSP&S programs have the opportunity to define their student outcomes comprehensively and then consider ways to collect and use that student data to make program and campus decisions.
4. Once effective measures of HTC student and programmatic success have been established, a second study to examine DSP&S student outcomes should be undertaken. Since access to an HTC program represents only one factor in an array of DSP&S services that contribute to student outcomes, such a study would need to be much broader in scope, adequately funded and conducted over an extended period of time.
5. Within the evolving context of technology and higher education, the roles and responsibilities of HTC staff have changed. The HTCs surveyed acknowledged this and have tried to respond to increasing requests for campus information and outreach opportunities. To support this more complex role, the staff will need training and support in the use of more sophisticated technology and in the emerging roles of community outreach, advocacy, and campus negotiations.